

Because the technique is reversible and does not affect the recurrent laryngeal nerve's ability to regenerate, it is feasible to do it immediately after recurrent laryngeal nerve injury, offering yet another option to those patients in whom vocal cord function may return.

Anastomosing the ansa hypoglossi (cervicalis) nerve to the recurrent laryngeal nerve offers a third alternative in the rehabilitation of unilateral paralysis. This procedure, although not capable of restoring cyclical vocal cord adduction and abduction, appears to restore vocal cord tone, hence improving the voice in a more physiologic manner than polytetrafluoroethylene (Teflon) injection or thyroplasty. Most otolaryngologists administer polytetrafluoroethylene, and some have learned the thyroplasty technique. Nerve transfer has been used in only a few centers in the United States. Until further data regarding thyroplasty and nerve transfer are available, the final decision regarding which procedure is used must be based on a laryngologist's experience.

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Phonatory Diagnosis and Phonosurgery

PHONATORY DIAGNOSIS involves the anatomic, vocal, and physiologic examination of the larynx. In any patient with vocal dysfunction, an anatomic evaluation is essential to rule out a potentially treatable malignant, inflammatory, or neurologic disorder. Since the time of Bozzini (1806) and Garcia (1854), the larynx has been visually examined by indirect mirror laryngoscopy. Rigid telescopes now provide the clearest, best illuminated views in awake patients. Flexible nasal fiberoptic laryngoscopy also provides excellent views even in uncooperative patients or those with difficult anatomy; gagging is virtually eliminated. Flexible or rigid endoscopic images may be recorded on video equipment for restudy and for patient education. Stroboscopic illumination calibrated nearly, but not exactly, to the fundamental frequencies produced by a patient's larynx gives a slow-motion view of the cycle of the vibrating vocal cords. This and ultrahigh-speed photography have delineated a vertically oriented mucosal wave that can be disrupted by the smallest mucosal alteration. A "clean" mucosal wave is required for optimal voice production.

A vocal examination of the larynx includes precise acoustic measures, such as airflow duration, frequency, range, intensity, and voice stability. The most important aspect of the vocal assessment remains subjective and is simply the "ear" of the voice professional and of the patient.

Physiologic tests of laryngeal function are less commonly used. Electromyography is useful for determining denervation versus reinnervation or fixation. The procedure may also be useful in the early diagnosis of degenerative neurologic disorders. In electroglottography, a potential difference occurs across the anterior neck. Current flows when the vocal cords are in contact, which provides an electrical correlate of vocal cord approximation. The vocal cords are supported by

a relatively immobile cartilaginous framework; contraction is largely isometric and leads to tension. Because vocal-fold intramuscular pressure correlates with tension, monitoring the intramuscular pressure may provide diagnostic information in a variety of neuromuscular disorders.

Once the cause of the phonatory disorder is identified, proper treatment can be instituted. Malignant neoplasms and inflammatory disorders are treated as necessary. A laryngeal procedure may be done solely to change the voice. Administering polytetrafluoroethylene (Teflon) is the time-honored technique for moving the vocal cord medially, and it may be done under local or general anesthesia. It is not reversible and does not address vocal cord tension problems. When done skillfully, results may be superb, but some patients do not tolerate polytetrafluoroethylene well; granuloma formation and extrusion may occur. The laryngeal framework operation allows surgeons to alter the position and tension of the vocal cord without touching the cord itself. The vocal cord may be moved medially or laterally; it may be tensed, relaxed, or a combination thereof. By altering only the laryngeal framework, the mucosal wave is not disrupted. These procedures are done with the patient awake and vocalizing. This allows a fine tuning of the voice with simultaneous viewing of the glottis on a videoscreen. These procedures are adjustable and reversible. Reinnervating a paralyzed larynx is also occasionally an option. A traumatized nerve can be reapproximated with variable results. For recurrent laryngeal nerve paralysis, a nerve muscle pedicle transfer from the ansa cervicalis nerve can be used to help maintain vocal cord tone, position, and possibly appropriate motion with respiration.

In summary, with current diagnostic techniques, the specific deficit causing vocal dysfunction may be identified. Using the proper technique, the deficit often may be reversed and the voice improved.

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Skull Base Surgery

UNTIL RECENTLY, extensive tumors originating in the nose and paranasal sinuses, the orbit, the nasopharynx, and in the parapharyngeal space that extends to the bones of the under-surface of the anterior and middle cranial fossa were considered by head and neck surgeons to be inoperable and usually incurable. Tumors from the clivus, the meninges, and the skull base skeleton that extended into the deep recesses of the face were similarly considered to be unresectable by neurosurgeons. The combination of a head and neck surgeon, neurosurgeon, and, when needed for reconstruction, a plastic surgeon is now able to eradicate these tumors completely and to rehabilitate many of these patients. The team approach is paramount for a successful result. Nonsurgical disciplines such as neuroradiology and angiography in the preoperative evaluation; pathology and anesthesia intraoperatively; and radiotherapy, nursing, and prosthodontics postoperatively are integral for the overall successful care of these patients.